Official Transcript of Proceedings

NUCLEAR REGULATORY COMMISSION

Title: Advisory Committee on Reactor Safeguards,
Digital I&C and Electrical Systems
Open Session

Location: teleconference

Date: Thursday, March 20, 2025

Work Order No.: NRC-0269 Pages 1-73

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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DIGITAL INSTRUMENTATION & CONTROLS AND ELECTRICAL SYSTEMS (DIGITAL I&C) SUBCOMMITTEE

OPEN SESSION

THURSDAY

MARCH 20, 2025

The Subcommittee met via Video-Teleconference, at 1:00 p.m. EDT, Thomas E. Roberts, Chair, presiding.

COMMITTEE MEMBERS:

THOMAS E. ROBERTS, Chair

RONALD G. BALLINGER, Member

VICKI M. BIER, Member

VESNA B. DIMITRIJEVIC, Member

CRAIG A. HARRINGTON, Member

GREGORY H. HALNON, Member

ROBERT P. MARTIN, Member

SCOTT P. PALMTAG, Member

DAVID A. PETTI, Member

MATTHEW W. SUNSERI, Member

ACRS CONSULTANTS:

DENNIS BLEY

CHARLES BROWN, JR.

DESIGNATED FEDERAL OFFICIAL:

CHRISTINA ANTONESCU

P-R-O-C-E-E-D-I-N-G-S

1:00 p.m.

CHAIR ROBERTS: Okay. This meeting will now come to order. This is a meeting of the Digital I&C and Electrical Systems Subcommittee. I am Tom Roberts, chairman of today's subcommittee meeting. ACRS members in attendance in person are Ron Ballinger, Craig Harrington, Greg Halnon, Bob Martin, Scott Palmtag, Matt Sunseri, and myself. ACRS consultant present in person is Charlie Brown. ACRS members in attendance virtually via Teams are Vicki Bier, David Petti, and is Vesna on?

MS. ANTONESCU: She's supposed to be.

CHAIR ROBERTS: And Vesna Dimitrijevic. Thank you. And Dennis Bley, our consultant, is also online via Teams. If there's any other ACRS members or consultants that I've left out, please speak up now.

So Christina Antonescu of the ACRS staff is the Designated Federal Officer for today's meeting. No member conflicts of interests have been identified for today's meeting, and we have a quorum.

During today's meeting, the subcommittee will receive information on the staff's electrical power and environmental qualification activities.

It's worth noting that this subcommittee, which is commonly referred to as the Digital I&C subcommittee, also has to review electrical systems issues. While we periodically hold meetings to review the status of digital I&C issues, we have not retained or been asked to review electrical systems issues. With that, we could not find a record of any such previous meetings. Given the importance of electrical systems and reliability and safety, now is a good time to start such briefings, and we greatly appreciate the staff's efforts to put together today's briefing.

The staff will brief us on several current issues, including revised guidelines for environmental qualification of electrical equipment, alignment with the Commission's probabilistic risk assessment, or PRA, policy, and several draft new and updated regulatory guides. Also, the staff will address ongoing coordination with the Federal Energy Regulatory Commission (FERC) and North American Electric Reliability Corporation (NERC) on the state of the grid and international activities.

The ACRS was established by statute and is governed by the Federal Advisory Committee Act, or FACA. The NRC implements FACA in accordance with its regulations found in Title 10, Part 7, of the Federal

Code of Regulations. Per these regulations and under the Committee's bylaws, the ACRS speaks only through its published letter reports. All member comments will be regarded as only the individual opinion of that member, not a committee position.

All relevant information related to ACRS activities, such as letters, rules of meeting participation, and transcripts are located on the NRC public website and can be easily found by typing about us ACRS in the search field on NRC's homepage. The ACRS, consistent with the agency's value of transparency in regulation of nuclear facilities provides opportunities for public input and comment during our proceedings. We have received no written statements, or requests to make an oral statement, from the public. We have set aside time at the end of this meeting for any public comments.

The subcommittee will gather information, analyze relevant issues and facts, and formulate proposed conclusions and recommendations, as appropriate, for deliberation by the full committee. I expect today's meeting will be informational only, and there won't be any further deliberations, but we'll decide that at the end of the meeting.

A transcript of the meeting is being kept

and will be posted on our website. When addressing the committee, the participants should first identify themselves and speak with sufficient clarity and volume so that they can be readily heard. If you are not speaking, please mute your microphone on Teams or by pressing *6 on your phone.

Please do not use the Teams chat function to conduct sidebar discussions related to presentations. Rather, limit use of the meeting chat function to report IT problems. For everyone in the room, please put all your electronic devices in silent mode and mute your laptop microphone and speakers. In addition, please keep sidebar discussions in the room to a minimum since the ceiling microphones are live.

For the presenters, your microphones are unidirectional and you'll need to speak into the front of the microphone and pull them closer to you to be heard. If you have any feedback for the ACRS about today's meeting, we encourage you to fill out the public meeting feedback form on the NRC's website.

With that, we'll now proceed with the meeting and I'll ask Mr. Wendell Morton of the NRR staff to begin opening statements. Wendell.

MR. MORTON: We very much appreciate that. So my name is Wendell Morton. I'm the branch chief of

Electrical Engineering Discipline in the Division of Engineering and External Hands and also Nuclear Reactor Regulation. I want to say we appreciate the ACRS invitation for this meeting. It's been a first-of-a-kind for us, and we're looking definitely forward to the conversation and giving you an update on the wonderful things the staff is doing in the electrical discipline.

Obviously, we deal with a lot of challenging topics and issues, as well, (Audio Interference.) participating in past meetings and had a lot of successes, and this presentation will go a long way to just give you an update on all those great things we're working on to kind of, you know, further the NRC's mission of being a modern risk-informed regulatory. Along with my staff, I want to definitely thank them all for contributing to this presentation and also for the wonderful work that they do to support us and also our management here, as well. Our division director, Tania Martinez Navedo, is right here next to me.

So with that being said, we thank you for this invitation and look forward to this conversation and may more come in the future. And after that, I'll kick it to my staff who will be giving this

presentation, Sheila Ray and Liliana Ramadan.

MS. RAMADAN: Good afternoon. My name is Liliana Ramadan, and, as Wendell stated, we are here to present an overview of our electrical engineering activities. And if we can go to the slide for the overview of pertinent regulations. It pretty much gives a depiction of what regulations our activities fall under.

Next slide. This slide specifically focuses on how we review complex electrical engineering safety and regulatory issues within the licensing purview. Some of our evaluations include designs that propose electrical tower system modifications to operating reactors, such as license amendments, notice of enforcement discretion allegations and power uprates. We also provide specialized technical assistance and advice to other divisions, regions, and offices. We participate in audits and inspections as technical specialists and team members.

Next slide. In the next couple of slides, I will be going over the open-faced condition. And with that, what is open-faced condition, also known as OPC? It's the loss of two of three phases of the off-site power circuit on the high-voltage side of a

transformer connecting an off-site power circuit to the transmission system. The operating experience and the Byron event demonstrated that OPC may be difficult to detect by the existing plant instrumentation and electrical protection schemes under all operational conditions, and there is a potential for severe voltage unbalance resulting in the degradation or the failure of electrical equipment. In some cases, the inability to detect and disconnect the degraded power source from the safety bus prevents the transfer to a standby off-site power supply and the standby alternating source. OPC is considered not a common event. Next slide.

CHAIR ROBERTS: If I could pause you just for a little bit. I had asked for this to be in the presentation because this was a major electrical power issue back in the 2012 to probably 2015 time frame, and there was a lot of activity that took place through the entire fleet to address these issues. And it was almost closed out until the Palisades plant decided to restart. They listed this as one of their major open issues in the presentation they gave us several months ago.

So given the time that's passed and the fact that many of us were not involved with the ACRS

or NRC activities back 10 - 12 years ago, I thought it worth a little bit of time for the staff to review the issue and bring us up to speed on what the concerns were and what they still are.

MR. BROWN: Just one observation on the open phase. AC circuits, basically, are either three-phase Y connected, like the Y, or they're delta. If you have a Y connection and you lose a phase, you go from three to one, which is very difficult to detect. The delta can actually keep operating because you still have two out of three phases, and it presents another set of problems in terms of the currents issue, the size of your tables. So I just want to try to give a little, call it a lecture or an observation on what it really means when they talk about open-phase circuits because it's not necessarily obvious to all those who don't deal with this garbage all the time.

Anyway, that was just trying to give people a calibration.

MS. RAY: This is Sheila Ray, senior electrical engineer in NRR. I just wanted to mention the bulletin is already closed out, and we'll be discussing a little bit further on that. I just wanted to clarify.

MS. RAMADAN: Next slide, please. The NRC addressed OPC through NRC's Bulletin 2012-01 which focused on the design vulnerabilities that require the licensee's response to mitigate potential impacts on safety. To address OPC, the licensee had two options: the auto-detection option and the risk-informed option. As the bulletin noted, approximately 65 percent of the operating reactors adopted the risk-informed option. And what the risk-informed option basically allowed the licensees and applicants to demonstrate that operator manual would be sufficient to mitigate the impact in lieu of automatic protection.

Next slide. And this slide depicts some of the past actions taken by the staff. As stated earlier, the NRC issued Bulletin 2012-01 to request information about the facility's electrical power system designs in the light of the OPC design vulnerability. In response to the Bulletin 2012-01, the licensee stated that the OPC design vulnerability existed at all operating reactors.

In 2013, the industry-wide initiative was submitted of the proposed resolution to the OPC issue. A summary report documented the NRC staff's review of the licensee's response.

In 2015, BTP 89 was issued to provide the OPC-related guidance to conduct license amendment reviews. In 2016, the Temporary Instruction 2515/192 was developed to provide NRC inspectors guidance to verify interim compensatory measures to the OPC issue. In 2017, the SRM to the SECY-16-0068 established a basis for the OPC evaluations and direction to the staff.

Next slide. In 2020, the NRC developed the TI 2515/194 that provided to the inspectors guidance to verify that the licensees appropriately implemented the NEI voluntary industry initiative. Using the TI 2515/194, inspectors conducted inspections at all operating reactors. In 2023, the OPC issue was closed by the bulletin through the FRN with the exceptions for Palisades and the Vogtle new units.

MEMBER HALNON: To give you all a little perspective from the licensee perspective or side of the things, a voluntary industry initiative is bubbled up to the CNOs and the committee called in SIAC. It's the Nuclear Strategic Initiatives Advisory Committee of NEI, and they all vote to kind of ratchet each other to do it and to make sure their responses back to the NRC is a commitment basically. And what it

does is puts a little bit more control in licensees' hands about whether it's safety-related and non-safety related or whether it's a detection or auto-trip, like the two options that you gave with the different ways that people could do it and also the timing of it because it would usually require some kind of outage to be able to install it. Obviously, locals put that aside. Palisades was shutting down, so they just let it expire basically. They said, we don't need to do it because we're not going to have any power going out on that. So this gave the industry a lot of flexibility.

I was going to ask you how did that voluntary initiative go through the bulletin? This is a high-visibility voluntary initiative. There's other ones, like the MRP, another thing we do through the materials folks. Could this go pretty well from your perspective, the standpoint of allowing the industry to kind of design and set the requirements themselves and be able to verify through temporary instruction?

MS. RAMADAN: Yes, it did. And there's a subject matter expert online that can speak to that, and I would revert to Vijay to kind of go over a little bit more on the specifics. Vijay, if you don't mind.

MR. GOEL: Yes. This is Vijay Goel from electrical engineering branch. Yes, I was very much involved with this. So it went very well actually. Initially, NEI came with their validity initiatives, and we definitely appreciated that. And, initially, they had, like, stripping that came with the risk-informed option, and NRC independently evaluated that. That is optional, legally good. So, basically, all the plants have implemented very satisfactory the open phase, and the NRC is satisfied with their responses and we closed the issues at all the operating plants. Thank you.

MEMBER HALNON: Thank you, Vijay. And the other option would have been the backfit plants. That's a very expensive and manpower-intensive on both sides of the table in that respect, so this saved a lot of money and a lot of flexibility on both sides. I'm not going to say they collaborated really well, but the industry offered up an acceptable solution and regulatory structure for that.

MR. GOEL: Yes, definitely. Yes, that's good. Thank you.

MR. MORTON: This is Wendell Morton, if I could jump in to make an additional point on top of Vijay's. I do think, coming in from a different

discipline, I&C, where I spent most of my bread and butter, I think this represents a really good example of a really good collaborative effort between industry and the staff in developing acceptable solutions --

MS. ANTONESCU: Can you speak up, please?

MR. MORTON: Can you hear me now? Sorry. I thought this really represented an excellent example of collaborative effort between industry and the staff to develop a technically-sufficient solution to address a problem that was identified that we all got mutual benefit from. So I want to point that out, too, and kind of re-emphasize that for the electrical discipline. Thank you.

CHAIR ROBERTS: This is a case where an event, and Charlie talked about it, Y versus delta, and the people that work in three-phase powers since, I don't know, a couple hundred years, at least a hundred years. But this is one where operating experience revealed a vulnerability where you had what was essentially an undetectable or undetected failure that could impede the operation of safety -- the cooler is important to safety, so it's important to come up with an approach to, you know, mitigate it.

And I guess, before we go back to you, Charlie, I was wondering if Dennis, who is very deeply

involved with the issues back when they were working in the, you know, 10 to 12-year time frame, Dennis, I wondered if you would make any more observations.

DR. BLEY: No. I think the staff is doing great. There were so many people jumping in. EPRI came and gave us a presentation on a solution that they developed, and some of the vendors were upset that they were competing with EPRI members to some extent. Anyway, they were good solutions.

MR. BROWN: One other observation, piece of information rather. If you lose it in a Y, everything goes to a stop. If you're in a delta configuration was the phase, if the transformer is rated properly, you can supply about, I think it's, like, 63 percent -- I haven't got the exact number; it's in the ballpark -- of the rated load. So if your rated load is actually on that transformer or whatever the gear you're coming out of is less than 63 percent, you keep on running. If it's greater than that, you may not see it, but all of your currents, everything is out of balance by then.

So you don't detect that by just listening to the plant. It's not particularly obvious. My Navy experience, I never ran into one of these in 35 years, so it's not like they happen all the time. And the

Navy is fundamentally Y-connected circuits, so, if you lose something, you're going to lose it in a plant pretty quickly just based on plant parameters. Just a calibration thought process on this issue.

PARTICIPANT: So there's no protection mechanisms in response --

MR. BROWN: It's not readily obvious, depending on the loads and the size. These are big transformers in many cases, so those single-phasing auto Y is more obvious because you rapidly start losing other things because it's feeding a number of different systems.

PARTICIPANT: And you would expect this to be something that could occur in lifetime of plant.

MR. BROWN: It turns out transformers are pretty darn robust, but, like I say, 35 years working on all the stuff I worked with over because Rickover expected us to be aware of all the electrical stuff, even though we were a downstream user of the power in the submarines, not solely responsible, although I hate to say it, anytime something broke, he told us to make sure it got fixed.

MEMBER HALNON: That's pretty good, Charlie. It took you only 20 minutes to get through the right -- other one.

(Laughter.)

PARTICIPANT: It's an honest question, though, if he was you'd think that, because the phase became disconnected at an operating plant, and they initially had trouble detecting it, but they detected all the ancillary effects of the voltage.

MEMBER HALNON: I was going to mention, that's the safety issue, especially with the deltas issue. This is the power going back into the plant, the essential services power, not necessarily power going out, although that's a problem, too. But you could be running your equipment and it degraded, and not know it and be messing up the motors in addition so they're not operability. So you lose your ACCS operability pretty quickly.

MR. BROWN: An unbalanced day's operation can overheat motors, all types of other items that you've got that are fed by three phase.

DR. BLEY: As Charlie says, the unbalanced condition can lead to really high currents, and they go high fast enough that the protective circuits won't protect the equipment. It's possible.

MR. BROWN: They can also stay under the -- depending the load on that particular transformer's configuration. They just sit there and sizzle for a

while.

PARTICIPANT: So, Tom, what was the fix? What would that be? Just a detect --

CHAIR ROBERTS: I'll have to turn that back to Liliana, but the two-phase would always have some sort of detection circuit, and the other was to do a risk-informed evaluation that you could basically deal with the delay in finding the problem when it happens. I hope I read that right.

MR. BROWN: And that's what the Navy did. We never put anything in, at least to my knowledge.

MEMBER HALNON: At some points but some phase-to-phase monitoring in with alarms that may have complemented the risk-informed way. Some put automatic systems in. They tried to stay from the automatic systems just because of the maintenance and all the stuff around it, but there was some hardware usually on the --

(Simultaneous speaking.)

MEMBER HALNON: Detection protection, yes.

MEMBER HARRINGTON: The challenge is if it happens on a standby transformer that's extremely lightly loaded, you just can't detect it because there's no --

MS. ANTONESCU: Can you please identify

yourselves when you speak --

MEMBER HALNON: Yes. This is Greg. Part of the problem is the plants would go on their auxiliary power and running off their output of their transformer generator to get the fast transfer to the -- essentially, even when you're getting fast transfer, if you have a lost split one phase out, then you're done because this usually happens out in the switch yard or beyond where you lose that problem, or you lose that phase.

MS. RAMADAN: Next slide. As stated in the previous slides, we reviewed complex electrical engineering safety and regulatory issues in the licensee's review, primarily of the combined operating license applications research test reactor amendments and certification reviews for advanced reactors under 10 CFR Part 50 and 52. And, currently, we are engaged in pre-decisional application review activities for the Natrium reactor, and we also continue to engage in the review activities for the NuScale US460 standard design approval for the light water technology small modular reactor. On November the 5th, 2024, we presented to the ACRS subcommittee the staff's review of the US460 Design Approval Application Final Safety Analysis Report, revision 1, for Chapter 8, Electrical

Power.

Next slide. And for this one, we're just currently evaluating electrical systems in support of decommissioning activities.

MEMBER HALNON: The Crane Energy Center is working on repowering their -- they sold one of their big transformers to TMI 2 for decommissioning. Are you or will you be involved in making sure, when they repower Unit 1, that they haven't dismantled electrical systems such that they weren't keeping their cable -- a lot of things go down, go away when you're decommissioning and go to cold and dark condition. Will you be doing any kind of interaction with them to make sure that their electrical systems are back up to snuff?

MS. RAMADAN: For the decommissioning aspect of the electrical reviews?

MEMBER HALNON: No, the repowering of Unit 1.

MS. RAMADAN: I would refer to Wendell on the specific question.

MS. MARTINEZ NAVEDO: This is Tania Martinez Navedo. With respect to that particular restart project, it's very early in the project to have advanced technical discussions, but I do say

that, for Palisades, there has been some touchpoints with the electrical staff. So that might be a potential conversation we're going to have with them.

MEMBER HALNON: Okay. Yes. It seems like, somehow, you're going to have to be involved, especially when you start looking at the submerged cables in units that have been shut down. You don't worry about the cable balls getting filled with water if you don't have any power going through them back. So it seems like there would be some that we (Audio Interference.)

MS. MARTINEZ NAVEDO: Yes. That and, for example, if somebody needs to provide some information on the equipment that held qualification during the time the plant was shut down. So there are conversations of that sort happening at this moment for Palisades, but we will certainly have those further projects.

MEMBER HALNON: They have to come in and start talking. Thanks.

MS. RAMADAN: Next slide, please. We also review electrical engineering safety and regulatory issues in license renewal and subsequent license renewal reviews under 10 CFR Part 54 where we focus on the license renewal review to ensure that the effects

of aging will be adequately managed throughout the period of extended operation. As a background, license renewal is the renewal from 40 to 60 years. A subsequent license renewal is from 60 to 80 years.

Our electrical reviews are limited to long-lived passive in-scope components, including SVO recovery path. They're mostly limited to cables, fuse holders, metal and closed bus, connections, switch yard insulators, transmission conductors.

The aging management programs are primarily condition monitoring with limited actions. The electrical time-limiting aging analysis is usually covered under the EQ program. High voltage insulators and transmission conductors are covered at site-specific further evaluation.

Currently, in-house, we are reviewing Perry, Diablo Canyon, Browns Ferry, Clinton, and Dresden applications. The remainder of the application safety evaluations have been completed. Also in-house, we are currently adjusting to new metrics where we continue to apply process improvements, lessons learned, and engagement with industry to ensure that appropriate credit for operational programs occurs.

Next slide. We also collaborate with

research on these projects. For the valve-regulated lead-acid battery project, it's basically we are doing a feasibility study to determine how the operational and environmental conditions and failure modes could affect the service life for VRLA batteries, and this project currently has a direct correlation to what we are currently working in-house.

The second project, the islanding, is basically a research that would determine the --

CHAIR ROBERTS: Liliana, what would be the end result for the VRLA study? Would you rather have a reg guide or add to a reg guide some endorsement of, you know, approaches to refine a VRLA battery?

MS. RAMADAN: Yes. And, currently, once that's completed, our intentions are to do a new regulatory guidance on this particular technology.

CHAIR ROBERTS: So what are you seeing so far? Are there any hard spots or things that are challenging?

MS. RAMADAN: Right now, we're currently in the draft stages of the regulatory guidance, and we have taken some exceptions to it. But we also, for the IEEE standards that we're endorsing, they are currently getting updated and the final publication should be occurring and we will follow pursuit with

our guidance.

CHAIR ROBERTS: Okay. So no technical issues that you know of, just trying to get synchronized with the paper?

MS. RAMADAN: Correct. None that we are aware at this point.

CHAIR ROBERTS: My understanding is the reason why NuScale EDAS system is not safety related is because there's no, you know, technical bases for the VRLA battery; is that right?

MS. RAMADAN: Correct.

CHAIR ROBERTS: Okay. Thank you.

MS. RAY: We also are involved in the assessment of the NUREG/CR-7153, and we also are involved in the future-focused research, which is a study on novel and innovative cable condition monitoring techniques.

CHAIR ROBERTS: Can you talk a little bit more on islanding? I might have missed it. What is islanding and what's the focus of the research there?

MS. RAMADAN: Islanding is, basically, we're trying to determine the possible challenges for the nuclear power plants and advanced reactors during the transition, operation, and recovery from islanding mode operation. Just trying to get an understanding

of what the mode rejection events would be, what would be the electrical power system responses, and what those challenges would be.

MEMBER HALNON: Okay. Islanding would be, like, a microreactor that supplies its own grid, and there's nothing else to support?

MS. RAMADAN: Correct.

CHAIR ROBERTS: Okay.

MS. RAMADAN: Next slide. We provide evaluation for design applications for new reactors, advanced and small modular reactors regarding the EQ program. For the license renewal and subsequent license renewal activities, we engage in the review of electrical components within the EQ program of electrical equipment for managing the effects of aging for applicable components during the period of extended operation.

With the proposed rule on increased enrichment of conventional and accident tolerant fuel design for light water reactors, there's a potential request by the licensees to increase the power output of reactors, and we are currently involved in the EQ review to ensure that the structure systems and components are able to accommodate the conditions that would exist at these higher power levels and the

extension of the refueling frequencies.

Some of these conditions can have potential impacts to the EQ design input, such as the radiological dose, pressure, and temperature. So that's currently what we are working on during this program. Next slide.

CHAIR ROBERTS: Are you going to talk later about design basis versus beyond design basis environments? Okay. I'll wait until you get there.

MS. RAY: Thanks, Lily. I'm going to take over. My name is Sheila Ray. I'm a senior electrical engineer in the Electrical Engineering branch. I've been here 20 years. Also, I'm a licensed professional engineer in the state of Maryland.

We're actually going to switch topics to infrastructure, and I'm really excited to share the immense work we do in this area. So both electrical and PRA staff participate in several IEEE groups, provide technical expertise, and to present agency positions for potential inclusion in standards. Specifically, we participate in the IEEE Power and Energy Society in the committees listed on this slide.

We developed a successful and cohesive vision and strategy to endorse IEEE standards and regulatory guides. Our strategy is multifaceted and

results in efficiency and regulatory processes and reduced time frames to complete reg guides. In line with the ADVANCE Act, we endorse standards for future reactors. We focus on the mission and regulatory requirements when determining if a standard should be endorsed in a new reg guide or to revise an existing reg guide. This approach for staff and constituents allows them to navigate and use reg guides, and it prevents an ad hoc approach.

Also, as the group gathers and analyzes operating experience, it informs the reg guide process. For example, the timing of a reg guide update may change if there's numerous operating experience events on a particular component.

Our strategy includes creating and revising reg guides such that they're applicable to licensees and applicants subject to 50 and 52. Thereby, the reg guides are applicable to operating reactors, new reactors, advanced reactors, SMRs, as well as nuclear facilities in some cases.

Slide 21. Oh, sorry. Slide 20. In our strategy, we ensure reg guides are fully aligned with Commission PRA policy and provide risk-informed and performance-based metrics. We particularly focus on combining standards on one technical topic in a reg

guide. For example, in Reg Guide 1.9, we focus on emergency on-site power sources, including diesel generators and combustion gas turbines. Another example is Reg Guide 1.204, where we endorse multiple standards on lightning protection.

This strategy is beneficial in several ways. It reduces staff hours, reduces costs, creates a one-stop shop for agency policy on the technical topic, and allows for greater efficiency.

Slide 21. Given the numerous IEEE standards, a variety of staff working on reg guides, and applicability to 10 CFR Parts 50 and 52, a tool was developed for staff to understand the reg guide process and also increase process efficiency. While research owns the reg guide process, electrical staff are the technical leads and develop the content of the reg guide. The checklist is a living document that outlines actions for staff and incorporates lessons learned.

Another example of our commitment to process efficiency is the development of a briefing sheet that highlights risk principles when presenting to management.

MEMBER HALNON: Where it says your electrical staff has technical leads, can you just

explain how research, since they kind of control the reg guides, how they work with you on that? Plus, I assume that there's committee intendants and membership, as well.

MS. RAY: Sure. So many electrical staff attend the IEEE working groups to develop a standard, so we are including the NRC position in the standards for consideration. So many of those staff will write the actual reg guide to endorse the standard, and then, usually, when we write the reg guide, we'll hand it over to research and they take it through the process, meaning through the concurrence process, providing it to ACRS for comment, issuing it for public comment. And then, once the public comments are in, they gather the public comments, and then the technical lead will address the public comments and revise the reg guide. And then research will then finally issue the reg guide. So it's a very much joint hand-in-hand collaboration.

DR. BLEY: Sheila, this is Dennis Bley. Kind of how has that been working when the nuclear is not the main actor in all this electrical stuff but we're a significant actor? You get the standards the way you want them pretty well, or do you have to do quite a few exceptions and clarifications?

MS. RAY: It depends on the regulatory guide. As you mentioned, there are some IEEE groups that are specific to nuclear and others where the equipment is not specific to nuclear. For example, batteries, vented lead-acid batteries are used in many industries: telecom, military. It's not specific to nuclear. So in those cases, sometimes, we may have to add some clarifications or supplements.

For reg guides or standards particular for nuclear, I think it's an easier process to endorse them.

DR. BLEY: That makes sense. Thanks.

MS. RAY: Sure. Other questions? Moving on to slide 22 regarding Draft Guide 1427. This is Qualification of Fiber-Optic Cables, Connections, and Optical Fiber Splices. The DG was issued in October of 2024. We received public comments, and the staff has addressed them. Final reg guide is in concurrence and expected to be issued in spring 2025.

Slide 23. We have seen some --

DR. BLEY: Dennis again. On the fiberoptic stuff, is there much of it in the plants now? I'm not aware. I haven't been out there a lot in the last few years. What have we been doing before we get this guidance?

MS. RAY: There were two questions in there. What fiberoptic cables are in there, my understanding, it's more for instrumentation than power. It's control systems.

CHAIR ROBERTS: They use it for isolation quite often to prevent crosstalk between channels.

MS. RAY: I'll also defer to my colleague, Matt McConnell. I think he's on the line.

MR. McCONNELL: Yes. Good afternoon. This is Matthew McConnell, senior electrical engineer in the Long-Term Operations and Modernization branch in NRR, and also the agency's EQ SME.

So with regard to the question on fiberoptics, we've been seeing that more often in the digital I&C upgrades. And, generally, these fiberoptic cables are installed in locations that would be considered a mild environment, so it would be covered under more the 50.55(a)(h) or the GDC-4 criterion for qualification versus 50.49, hopefully, to answer your question.

DR. BLEY: Yes, that's good. Thanks.

MS. RAY: Member Bley, did that answer your second question, as well?

DR. BLEY: It's good enough. Thanks.

MS. RAY: Okay. We'll continue. Slide

23.

CHAIR ROBERTS: Just to clarify, on the previous slide, the plan to issue the final reg guide in spring 2025, the process would have you run it through the ACRS staff first, so when do you expect that to happen?

MS. RAY: In the next coming weeks.

CHAIR ROBERTS: Great. Thank you.

MS. RAY: It's in concurrence. Once we get to a certain point in concurrence, it will be shipped over to you promptly.

CHAIR ROBERTS: Great.

MS. RAY: So one of the comments from ACRS member -- we really appreciate those comments -- was regarding the qualification of equipment for beyond design basis accidents. Staff added a clarification in the background section related to the 5155 equipment relied on for beyond design basis must have sufficient capacity and capability. And to demonstrate that capacity and capability, type testing was used to --

CHAIR ROBERTS: Yes. Probably should interrupt you to give a little background, people may not remember from six months ago, but we had a discussion on this draft guide and one of the concerns

I had was that the draft guide had several exceptions listed, I think there were six total, all would have said that anything in the IEEE standard that had to deal with beyond design basis conditions. They called it design extension conditions, I think, is the international terminology used, but it's really for severe accident conditions where, basically there's an exception to not meet them, that they weren't invoked as requirements or what do you call it? They weren't invoked as operative guidance. And I was wondering why that would be the case because there are certain requirements in the regulations for beyond design basis conditions, you know, things like -- the complementary design criteria I think they're called in LMP, for example, requires you to have equipment operability in those environments and there was some discussion of non-safety with special treatments for advanced light water reactors.

So it wasn't clear to me why those would be excepted, you know, take an exception to in the draft guidance. SO I think Sheila, your -- intent was to answer that question.

MS. RAY: Sure. So our regulatory guide focuses more on design basis accidents. So in that case, we are taking an exception that you don't have

to use all of the type testing for design basis. You can use type testing to demonstrate the capacity and capability for design basis -- I'm sorry -- severe accident. You do not have to use type testing or severe accident, but it's one method to demonstrate --

CHAIR ROBERTS: I think they're agreement is setting to use the term as applicable or some buzzword, so it wasn't a requirement implied in the IEEE standard that you had to meet all the severe accident environmental conditions. It just said you had to look at whether or not it was appropriate.

So, again, it wasn't clear to me why there was an exception taken to those types of statements, and it also seemed like the reg guide was, at one point -- was it 89? I probably don't get the numbers right but the one on, overall, the environmental qualification, not specific to fiberoptics, did not take exception to some of the guidelines that were in that IEEE standard.

So I was just trying to understand what is the overall theme? You know, what is it you're trying to communicate with these exceptions?

MS. RAY: It's more of that, for design basis, we wanted to make it very clear and then separate out beyond design basis. Go ahead.

MR. BROWN: This is for fiberoptic cable.

MS. RAY: Fiberoptics and --

MR. BROWN: That's what we're talking about. I just want to make sure I'm on the right page here.

MS. RAY: Yes.

MR. BROWN: I don't know about commercial experience, and we haven't had a naval nuclear reactor beyond design basis accidents occur. But in testing of normal cables that you find, electrical cables, and the advances in materials that they've used for insulations and other type stuff, there's some pretty severe steam and other temperature conditions that were beyond what you would design for, and they worked okay.

Fiberoptic cable is a totally different material and it sounds like you're using kind of a, well, they ought to maybe perform okay in the beyond design basis world and we're just going to kind of take a chance that they will. That's what I got. I'm not trying to be negative --

MS. RAY: Right. We're commenting that type testing is one way to demonstrate --

MR. BROWN: But I'm just saying that the type testing is one thing, but real world experience

of normal standard cables in environmental conditions that exceed what they are type tested for has generally been that they work. They might not work for three months, but they will work for three weeks or whatever it is, whereas fiberoptic cables are not -- that material that's internal to the cables is far less robust than copper and normal insulation materials.

So how do you translate that thought process into the beyond design basis world saying that we're not really worried about -- it sounds like we don't have any basis for making that extension; that's a better way for me to phrase it. So I don't quite understand that.

MS. RAY: I will also ask my colleague, Mr. Matt McConnell, to jump in.

MR. McCONNELL: Yes. This is Matthew McConnell again, senior electrical engineer with the NRR. It's interesting, speaking specifically to fiberoptics, that my experience with them and in talking with various vendors that have put them through significant testing with radiation, temperature, and whatnot, that, initially, there was concerns about potentially discoloration causing problems with the reflection/refraction properties to

be able to transmit signals, but they actually found in the end that, when they subjected them to the extremes, that the actual glass material itself had a healing property that would actually improve the actual signal strength. That's something that happened over time. It's almost like scarring where you or even a weld where you maybe are damaging, purposely damaging something, but then it gets improved over time.

So I just wanted to throw that in there as far as they are actually been demonstrated, they have been demonstrated to be rather robust, even though, currently, what we've seen is that they're being put into mild environments that would, under pretty much no circumstance, be exposed to what would be considered a severe accident or beyond design basis. Thank you.

MR. BROWN: Just one observation on the healing. That implies there's an initial degradation but that the radiation exposure over a longer term heals itself to some extent, and that's what I get out of it. But that sort of says the stuff doesn't work for a while, and then, several weeks later, it maybe works a little bit better after a while. But that doesn't help you again until in the initial parts.

I'm just trying to get the points across to make sure I understand where you're going with this. I'm not against fiberoptic cables; don't get me wrong. They have to be used in certain circumstances. We definitely don't want to use co-ax if we can use fiber from the normal digital controls and other type stuff because you get some that are performance on their operational capability.

But we have to be very careful on how we extrapolate and say everything is okay and then also while it heals later, but is that a month later, is that two weeks? If somebody had something that could tell us is this a matter of a few hours or is it a matter of a few weeks for this healing so that they come back and they work again. We haven't seen anything, we haven't heard anything, at least I haven't seen anything in the stuff provided, that would give us a flavor to what you're talking about in terms of this healing capability. I don't know if you've seen that, Tom, but I haven't, so that's my concern. I don't know whether Tom agrees with that or not totally.

CHAIR ROBERTS: I think it's a matter of having equipment that will work in the environment that's it's accredited to work in, which is what that

next-to-last sub-bullet, third sub-bullet on that list, says. Where it leaves me is that you're going to send us the latest, you know, graph from prior and the 1427 ready for issue, and we'll take a look at it. You know, certainly, that last major sub-bullet would resolve which it certainly could've had six months ago which is that your draft seemed to preclude using type testing if it says NRC doesn't endorse the position on the beyond design basis conditions, design extension conditions. And so if you're not endorsing, if that's the terminology, then I'm probably fine with it. I just want to make sure I understand where we end up.

MS. RAY: Yes. Our reg guide is focused on design basis, and so, in that case, you don't have to do type testing for design extension severe accident. However, you could do type testing to demonstrate the functionality in severe accident situations.

CHAIR ROBERTS: Okay.

MS. RAY: And the last thing is --

CHAIR ROBERTS: I had a comment just on a related topic, you know, the EQ environment is defined in Reg Guide 1.183, it's almost a severe accident environment because it assumes, you know a design release or a beyond design release into containment

and then, if the equipment was within a containment, you have to go qualify it in that environment. It's just getting you closer to a severe environment anyway.

At least with NuScale, they've gotten, I was calling it an exception, but a different approach to the reg guide. They do not assume a release in the containment for EQ, which kind of leads to another question of, okay, so for equipment that does need to survive that environment, you've lost the margin that you would have by using the more severe environment.

I don't know if you're seeing more applicants wanting to go the way of NuScale or whether there was any, you know, generic change you're thinking of making to more explicitly account for the loss of margin in some other guidelines?

MS. RAY: I'm going to defer to my colleague, Mr. McConnell.

MR. McCONNELL: Yes. Matt McConnell again. Yes, your comment is taken, understood. I wasn't involved with the NuScale review, but I understand what you're saying with regard to the assumed maximum hypothetical accident that need to be considered. And I think, going forward, we apply 50.49 as it's written, and we take that to heart as

far as what accidents need to be considered. We clarified the guidance in Reg Guide 1.89 to what needs to be met and what needs to establish the framework for which needs to be established.

If you see 50.49(b)(1)(c), I believe it is, basically, it discusses and says you must assume the maximum hypothetical accident. So under those circumstances, yes, the conditions could be quite severe and, you know, those would need to be considered. Hopefully, that answered your question.

CHAIR ROBERTS: Yes. I think that applied design with that maximum hypothetical accident isn't so bad, you know, compared to what's currently defined in the Reg Guide 1.183, then that's justified for that plant design, but that still now leaves, if you did have a beyond design basis kind of event, then you would have to meet the kind of requirements that are on the slide that's displayed right now, the 50.155(b)(1) requirements, the requirements for complementary design criteria in LMP, those types of things.

It's just something to keep an eye on. You kind of get that margin for free pretty much, but you use a reg guide environment because it's so severe. When folks get not necessarily exceptions to

the rule but exceptions to the reg guide, obviously, you don't have reg guides and regulations, so you have to, you know, except the approaches that would stay within the regulations.

So, again, I was wondering whether you're looking at more globally more than just NuScale used the less severe environment for the EQ environment, whether there was something you would think about putting out to mitigate that or whether what's already there are sufficient.

MR. MORTON: This is Wendell Morton. This is a matter of context for your question. Similar to the VRLA reg guide we are going to be producing, as we get more data points, we will be looking if we need to make some adjustments to our guidance, as well. But we do, on each of these designs, on a case-by-case basis, we see a consistent theme as we've been going through and we will adjust course or adjust our paths accordingly, as a general position to follow through, so thank you.

CHAIR ROBERTS: Okay. Thank you, Wendell.

MS. RAY: Lastly, on this DG, we removed the word exceptions and referred to items as regulatory positions.

So we're proud to share some of our

upcoming work, and this first one is IEEE 1819 on risk-informed categorization. The standard is being revised, and the standard is expected to be published in late 2026. The staff, including both electrical and PRA, would consider endorsing the new revision of IEEE 1819 in a new regulatory guide.

Additionally, on this similar topic, Reg Guide 1.201 is under revision by DRA.

MR. BROWN: Can I ask a question? As you said electrical and electric equipment. Is that now springboarding into the reactor instrumentation control and projection system world, or are you talking about -- or is this IEEE standard dealing with other stuff?

MS. RAY: I'm going to defer to my colleague, Khoi Nguyen, who is actually on the working group to revise 1819.

MR. BROWN: Well, it's really developing the new reg guide, right?

MS. RAY: Understand. We have not started the work on the reg guide because --

(Simultaneous speaking.)

MR. BROWN: Oh, the IEEE standard --

MS. RAY: Yes.

MR. BROWN: Oh, okay.

MS. RAY: Khoi.

MR. NGUYEN: This is Khoi Nguyen, Electrical branch in NRR. I'm the member of the working group three program in the 1819. The working group is currently working on the revision of the 1819 to include the guidance for electromag equipment beside electrical equipment. There's not much guidance on alternates beside how to characterize the equipment to implement 10 CFR 50.69.

Does that answer the question?

MR. BROWN: Does it apply to electronic equipment, like the reactor protection systems, or not?

MR. NGUYEN: Yes, it does.

MR. BROWN: So we're going to risk inform the design of reactor protection equipment, so it doesn't necessarily have to work based on a PRA. I'm being sarcastic a little bit there because when I turn and twist, I expect something to start, stop, or change state. When I tell a reactor to scram, I expect it to scram, not maybe scram. I'm having a little trouble, a little problem with the thought -- I'll wait until I guess I get to see the reg guide but --

CHAIR ROBERTS: Let's back up with this a

little bit. This is a process which already exists in Reg Guide 1.201. There's a process for determining what the risk significance is of various SSCs. A reactor protection system, I think, would be a hard sell, and we had a similar discussion this morning. It will be a hard sell to come to a conclusion anything but, you know, safety related, but you could get there. But the goal with this discussion was there is a Reg Guide 1.201 and I asked this here too, because there was a meeting three years ago where the IEEE spent the effort to kind of tailor the guidance in 1.201 to electrical and electronic equipment, and then industry came back and said we don't want it. And so that's the last I saw when I pulled the thread, so I was kind of curious where that currently is because the IEEE obviously, you know, didn't agree with that and said there was more discussion required as to whether or not there was value added by incorporating some of the thoughts that the IEEE committee came up with into Reg Guide 1.201 or had Reg Guide 1.201 reference it or whatever the right linkage was. But at least at that time, industry didn't want it.

And so the question, I want to understand where that was, what the story was.

MR. BROWN: I don't recall that the 16 years I was on the committee that we ever referenced 1.201 when you're designing the safety systems. It was making sure they would work. So if you risk-informed it completely and you say I only need one channel of scram protection and if it fails, that's okay. That's even a little bit extensive. I'm being sarcastic on --

CHAIR ROBERTS: So we had some hands up. I think I saw Dennis. I can't see the hands right now, but I think --

(Simultaneous speaking.)

CHAIR ROBERTS: Dennis, why don't you go first, and then we'll go to the staff.

DR. BLEY: Yes. Dennis Bley. Charlie always challenges me to say something. Whether you do a risk analysis or not, your system may or may not work, and there's plenty of history to tell us that, Charlie. But I don't remember 1819 in any detail. Is it consistent with the categorization and treatment discussions in NEI 1804, the LMP? Because if it's not, you're going to put somebody who is designing a plant in a bind. What do they use?

MS. RAY: I think I might defer to Mr. McConnell. He has his hand up.

MR. McCONNELL: Yes. This is Matt McConnell again. I don't know if I can answer Dennis's question, but the intent, I believe, was to avoid or minimize any potential conflict in guidance that's out there. That's part of the reason why we've kind of delayed the issuance of a reg guide in support of 1819, but that's maybe a topic of another conversation another day.

But I just wanted to kind of lay out and build on the concept that 50.69 doesn't have restrictions on what systems, structures, and components could be applicable for the categorization of treatment of equipment. So while it's highly unlikely that a reactor protection system would fall out of scope and allow you to take certain exceptions to be categorized as Risk 3 and 4, I can't say without a doubt that they would be. But that would be on a plant-by-plant PRA basis and based on the 50.69 requirements on how the equipment is categorized under their risk. Thank you.

DR. BLEY: Okay. Thanks. And I just would, because people can now use 1804, which does give guidance in this area, I hope the revision to the standard and to your reg guide are at least consistent with the guidance from the other document. Thanks.

MR. McCONNELL: Yes. If I could follow up. This is Matt McConnell again. I would say that, yes, we are going to strive or consistency, and we understand that there's existing guidance out there. I think some of the challenges have been with some of the equipment that's been allowed, say the Risk 3 and 4 equipment that is allowed exemption to the 50.49 environmental qualification requirements, but with the understanding that the equipment, even though it no longer needs to satisfy 50.49, that it still is expected to perform its design function and that you have to be careful to be able to satisfy common cause in the PRA and ensure that the system structures and components can still perform their function. Thank you.

MR. MORTON: This is Wendell Morton. So just to add some additional context to what Matt just said, we will be working on this particular reg guide in conjunction with our PRA experts themselves. We have a few that were actually on the committee that is overseeing this standard, and we will be working with them or developing this reg guide to make sure the relevance guidance is all consistent, to Matt's point. So I'd like to give some additional context, as well, that we're not developing this strictly in terms of

electrical. We'll be considering alternate plans as well.

DR. BLEY: That's really good. I appreciate hearing that because, at times, electrical has been a little in your own world compared to what everybody else is doing.

MR. MORTON: Understood. We're in a new world now. We appreciate that perspective. Thank you.

CHAIR ROBERTS: Dennis, this question started because one of the draft guides, I don't remember which one, but I think it was IEEE 338, if I remember right, has -- this IEEE 1819 is a required reference that you have to use, and when I pulled the string on that I found this, you know, three years ago whereas I just stated, we wanted to use 1819. So, again, I guess there's more discussion you have to come with that draft guidance to whether the reference is appropriate, and I think Dennis raises a great question, which is, when you look at harmonizing 1819 and 1.201, is 1.201 harmonized with NEI 1804 and there would be a discrepancy with what LMP would have you do and what the reg guide would have you do. And that's another thing that you might really look to get standardized if there is a inverse. I don't know that

there is. Certainly one's oriented towards 50.69 and one is oriented towards new plants, so is there a difference? I don't know that there needs to be, but while we're thinking about --

MR. MORTON: A lot of those issues we're going to be looking to actually develop the reg guide.

CHAIR ROBERTS: Okay. I think Khoi Nguyen from the staff has his hand up.

MR. NGUYEN: Yes, this is Khoi Nguyen again. So I would like to provide some history of the development of the 1819. So the Reg Guide 1.201 endorsing NEI 0004 for our prioritization of the SSC of the plant. However, NEI 0004 is lacking guidance for categorization of the electrical and electronic components. And IEEE 1819 provides details here. However, in the last few years, the industry pushed back on 1819 endorsement because of the concern of conflict with NEI 0004. Since then, the IEEE has been working with industry to address the industry concern, mostly on the special treatment. And that we'll be looking at in the next revision of the 1819.

For the question why Reg Guide 1.201 does not endorse 1819 because the schedule for Reg Guide 1.201 is to the Reg Guide within the next year does not support the new revision of 1819, so the staff

with the revision, or 1819 current within the schedule or by the end of 2026 the staff may endorse and stand that under a new reg guide. That's the reason why we have two reg guides and the two different standards.

MR. BROWN: I know I'm kind of the outlier in this, but so I will -- Tom knows very well that, as long as they allow me to be a consultant on this committee before formerly a member, I am particularly sensitive to this. For 22 years, I was responsible for, roughly, 140 nuclear power plants and all the submarines. I was very concerned about not having something work when you have 50 to 55,000 sailors in submarines depending on your equipment to operate continuously and still provide safe operation.

So I hate to be a thorn in the side of PRA and risk informing, I know we're going to do it in some areas. I don't disagree with it in some areas. But to me, there's always certain specific reactor protection safeguards and reactivity control systems that have to be very, very carefully guarded so that we don't make the wrong decisions when we're doing it.

So I'm not trying to be a thorn in the side of progress, but, at some point, we have to look at the safety systems and really be very careful how you deal with them, regardless of your sensitivity to

1.201, which I don't disagree with. I've seen it and looked at it. There are places where it's useful, and there are places where I won't say it won't be useful because we always use engineering judgment in some places. If I'm allowed to speak, you will always have somebody else willing to talk about an alternate thought process. And some of the members here remember that.

MS. RAY: We appreciate the comment. The staff is fully committed to safety and --

MR. BROWN: I'm not questioning your commitment to safety.

MS. RAY: I understand.

MR. BROWN: I have great respect for all the staff members I've worked with over the last 17 - 18 years, so I have no problem with that.

MS. RAY: We look forward to your comments on the reg guide when we finish it.

MR. BROWN: All right. Thank you.

MEMBER DIMITRIJEVIC: This is Vesna. I just want to summarize something which was already said here but just for Charlie, you know. Reg Guide 1.201 supports the 10 CFR 50.69, which gives the same risk-informed categorization. So 121 supports the 10 CFR 50.69, and there is also difference between those

two guidance in the scope because IEEE Standard 1819 is just for the electrical equipment, you know, the 201 is for all SSCs.

I just was summarizing something because, you know, it's not just the Reg Guide 1.200. I mean, that's a priority of the 10 CFR 50. Okay.

CHAIR ROBERTS: Okay. Thanks, Vesna.

MS. RAY: So on more upcoming work, Lily had alluded to a new reg guide on valve-regulated lead-acid batteries. Given several applications utilizing this technology, as well as industry comments to provide guidance on other battery technologies, we're working on this new reg guide. And this new reg guide would endorse with clarifications IEEE 1187 and 1188.

So these IEEE standards, as Lily mentioned, are under revision right now and are expected to be issued shortly. And, therefore, the staff's draft guide is expected by the end of 2025. Consistent with our vision and strategy, this reg guide endorses new technologies in line with the ADVANCE Act.

Also on batteries, staff is developing a revision to Reg Guide 1.158 on the qualification of safety-related vented lead-acid batteries. This reg

guide revision would endorse the latest IEEE 535 published in 2022. And the DG is expected in the summer of 2025. This is an example of the staff updating guidance in a timely manner to ensure the latest guidance is available to licensees and applicants.

Also of committee interest, Reg Guide 1.9, we worked on this a number of years ago, and work has now resumed. The diesel standard was revised late last year and is now a joint logo standard, meaning IEEE and IEC. Therefore, the staff has resumed work on Reg Guide 1.9 to endorse clarifications to standards on diesel generators and combustion gas turbines. This is an example of implementing our vision and strategy of combining related standards on a technical topic into one reg guide on standby power supplies. Yes.

MR. BROWN: We reviewed this back in 2021 or so, and we wrote a letter which you all responded to and then a second respond which said you were deferring for catchup, whatever, you know, because of other work. And I noted the difference here. The Reg Guide 1.9 that you presented to us covered three areas. One was diesels, one was safety combustion. The first item, C1, was other anticipated power

sources which was the source of most of our, was the most critical comment we made. You don't even mention that. Does that mean you're deleting C1 out of the reg guide or you're going to do something additional with it or not?

MS. RAY: I am going to defer to my management, Tania.

MS. MARTINEZ NAVEDO: Tania Martinez Navedo, acting Director for the Division of Engineering and External Hazards. Right now, are discussing how to reinsert that piece in the reg guide.

MR. BROWN: C1?

MS. MARTINEZ NAVEDO: Yes.

MR. BROWN: You're taking it out right now?

MS. MARTINEZ NAVEDO: No. We are actually keeping it because we are evaluating if we're going to keep it because it would be consistent with the new mission of the NRC as we're working on enabling new technologies. So based on some of the conversations with folks in the industry, this might be appropriate to lay out clear criteria they can follow if they want to use any other type of equipment outside of the EDG and the GGG equipment.

MR. BROWN: I didn't want you to think because we made that comment that we disagree with that. The problem was that, when you looked at the diesels and the combustion turbine generators, the performance requirements were laid out for each of those components in terms of what they had to deal with in the electric plants and how those plants responded in, like, load demands, harmonics, when you're going to alternate -- the vision here is windmills, okay, or solar because if you're going for the 145 acres of solar on your plant, in addition to the 17 in a nuclear power plant, including the diesels, you've got to be mindless if you want to do that, including the battery you'd have to deal with it. It would take a lot of real estate.

But if you did, developing all your plant loads, diesel generators become combustion turbine generators. The generators, they look like what they have to supply in the plants. They have harmonic performance. They have load demand, which you can put on them immediately. There will be covering time. When they put on a high load, it has to be within a time frame where everything doesn't drop off. Doing that with electronics, solar power, batteries, is very, very difficult, and my problem with it when we

wrote the letter was there was, basically, no identification of what the alternate power sources' performance would have to be. So that was the concern.

I just wanted to make it clear that, at least in my opinion -- I can't speak to the committee now but what the committee accepted at that time was the lack of definition of what those alternate systems would have to be designed to meet. And I don't mean the detailed design. We're not trying to tell them how to design the systems but the basic functional performance so that they'd be compatible with existing plants, or even the new plants, the advanced plants, are all going to have conventional electrical components and systems in them. They may have different coolants, they may have different other stuff, but the plants themselves are electrical stuff. And it was totally wiped out. And the other two components, there were very clear definitions of what their performance requirements were in order to meet this, the normal schedule.

So I'm just trying to clarify that don't take my comments negatively. It's just a matter of ensuring we make them compatible with what we required for the other components, as well, and to let you know

that I've done a lot of heavy-duty electronic stuff, and it is very difficult to get the harmonic performance that you want. It's just going to have to be addressed. I'm not asking for an answer. It's just we have to know how to address it before we go forward; that's all.

MS. MARTINEZ NAVEDO: And I appreciate it. This is Tania Martinez Navedo again. I appreciate that feedback and that clarification. Basically, what we were trying to do is to align the criteria with what is in GDC 17 capacity, availability, reliability and so forth, not centered on a particular technical, you know, particular component.

The reason why we are trying to propose this is that when we worked on the gas turbine generators as the emergency power source for a newer reactor design in the past, like US-APWR, it took the staff a sizable amount of hours to try to come up with an ISG and guidance that could support the review of that particular, you know, piece of equipment. At that point, there was no IEEE standard for gas turbines.

There was some operating experience out there, not in nuclear, but there was some that we could leverage. But what we want to do is pave the

way to the staff to do a review with at least some set of criteria they can use to review but, at the same time, tell potential applicants this is how you can write a footprint for your Chapter 8, even if you assigned something different than EDGs and GGGs. That's the real reason why we were trying to draft a new reg.

MR. BROWN: I was here when did the US-APWR, and the CTG was an issue we had to deal with. But the difference is the inertia in diesels is totally different from the rotating inertia of a combustion turbine generator; and, therefore, could they be relied on. One of the issues was could they be relied on to respond appropriately for what the plant needed, and you all struggled with that.

MS. MARTINEZ NAVEDO: We did, but we were able to --

MR. BROWN: You got through it.

MS. MARTINEZ NAVEDO: -- put together an ISG, and we have some guardrails that help both the reviewers, as well as the applicant, in continuing to provide the necessary information for a reasonable assurance finding.

MR. BROWN: All right. I'm just trying to clarify the nature of what the context of our comments

was when we wrote the letter three years ago, four years ago now, I think. Thank you. Sorry to take up your time. I'm not sorry.

(Laughter.)

CHAIR ROBERTS: Okay. It sounds like staff understands what the letter was getting at and they're still working through what the appropriate level of specificity is for the reg guide to cover things that, clearly, are not going to be covered in detail, just to give the applicant as to what they need to cover. So we look forward to seeing that in the fall.

MS. RAY: Okay. So in addition to regulatory guide activities, staff continues to align with the Commission PRA policy. Specifically, with the NuScale review, we applied a risk-informed graded approach to evaluate DC systems. Other examples include the potential endorsement of 1819, which we discussed and also open-phase the risk-informed option. And we'll be talking about BTP 8-9 in a later slide.

Slide 29. Other examples where we are fully aligned with Commission PRA policy is license amendment requests on tech spec task force travelers, 10 CFR 50.69, and tech spec completion times. In all

of these reviews, the staff uses PRA methods and data to complement the NRC's deterministic approach and support traditional defense-in-depth philosophy.

Slide 30. Staff is working on a revision to Reg Guide 1.118 on periodic testing to endorse IEEE 338. We received ACRS comments noting the paragraph in the background section on 50.155 was useful, so we have added it to other reg guides. In addition, the comment of IEEE 338 references risk-informed categorization; and, thereby, that will also inform our new reg guide to endorse 1819.

Slide 31. Based on lessons learned with license amendment requests and closing out the bulletin on open phase, staff is revising the guidance in two branch technical positions, as listed here. This is part of our effort to update guidance documents and incorporate risk-informed performance-based methods.

We routinely review operating experience on electrical and environmental qualification. We work with the Operating Experience branch to identify trends, and the review of operating experience informs the reg guide process such that revision should be initiated based on significant operating experience where the priority could be modified. Lastly, during

our participation with IEEE, NRC staff shared public information on operating experience to inform the development of standards.

We also work with other federal agencies and entities regarding the grid and grid events. For example, we restarted quarterly meetings with FERC and, most recently, in January, discussed Blackstart, Texas winter storms, and the quantified risk of LOOPs and station blackout. During severe weather events, such as hurricanes and flooding, we expertly work with NERC to understand the grid condition and any expected impacts to nuclear facilities. We lead and support biannual joint commission meetings with FERC where NERC also participates. This coordination with FERC and NERC strengthens our knowledge on the grid status and any potential impacts to nuclear.

We also are very active in the international arena. First, we participate in the IEC and assist in the development of international standards. Some successes include the joint logo standard on environmental qualification as endorsed in Reg Guide 1.189, the joint logo standard on diesel generators, and the joint logo standards on the condition monitoring of cables.

Other standards on grid coordination are

valuable as NPP designers may use them in U.S. licensing. Some applicants are adopting international standards in their design, and NRC's participation ensures U.S. perspectives in operating experience are considered.

Slide 35. We also participate in the Nuclear Energy Agency's WGELEC, the Working Group on Electrical Power Systems. This critical exchange of information and experience assists in our shared understanding and recommended solutions. This information supports our licensing work, as well as reg guide development.

Regarding IAEA activities, we're currently participating in two projects: one on the revision of a report on electric grid reliability and the interface with NPPs to specifically address SMRs. In addition, we participate in the updated IGALL for license renewal activities.

This past summer, we proudly hosted seven Polish experts over four weeks to exchange information on AP1000 electrical systems, environmental qualification, and inspections. The highly-successful collaboration was significant for Poland for the construction, licensing, and inspection of their future NPPs.

As part of the Romania bilateral cooperation, electrical staff supported in-depth discussions on environmental qualification and DC systems. In addition, we routinely respond to information requests from other countries on electrical topics.

CHAIR ROBERTS: In general, are you learning, you know, from the international community? And I guess the opposite of that is are they learning from you?

MS. RAY: Yes. It is definitely mutual understanding and shared information. Poland does things a little bit differently. They separate out the technical and the inspection, and some of their questions were very insightful for us, as well.

CHAIR ROBERTS: Do you have any examples?

MS. RAY: It's interesting how they review the electrical systems. They're very much looking at very specific design details that, as of right now, we don't have access to. For example, very specific calculations that maybe, like, Westinghouse would have done, they're going to the depth of that level, whereas we would more, we would audit some calculations, we may look at summaries of calculations where it seems -- since they're new, they're applying

their licensing experience to other technologies to nuclear, and it seems they're looking a little bit more pointedly at the calculations. And I think that's just their regulatory structure.

MR. MORTON: This is Wendell Morton. I can contribute a little more to that, as well, Sheila. So one of the big things during their visit was, obviously, comparing different regulatory models that they observed trying to develop their own and coming here to the NRC and learning how we do our business. So a lot of their questions were along the lines of how we do certain things in terms of audits, inspections and licensing; the level of depth that we are able to go to in the system meets all the requirements. There were a lot of exchanges and conversations along those lines: how do you guys do this, how does the NRC do this, how do we approach an inspection in a granular way or how do you approach your licensing for this particular housing.

So there were a lot of questions about, like, trying to understand how we do our business, as well as the framework itself. So part of that, a lot of part of it is just educate them on how we do our business and then giving them samples of what we do during our business in terms of licensing, inspection,

and even support, things of that -- to Sheila's point, they are differently structured than we are, so there are some questions that are just apples and oranges. We just do things differently.

CHAIR ROBERTS: Okay. Thank you.

MEMBER HALNON: One question before you get into your summary. I just, I know we love our SMRs and discussions we're having, one of the strategies --

(Audio interference.)

MEMBER HALNON: -- are you doing any studies or working with research on the impacts of the following on your quick plants?

MS. RAY: Something that's been discussed a number of times. We don't have any ongoing items on load following.

MEMBER HALNON: I mean, it does have impact all the way through the system. You know, it can be done on an application-by-application specific case, but that operating strategy may not be thought of, much like our light water reactors were thought of when we first built them and then they discounted it because of wear and tear, if you will, and make it simple. Now they're talking about doing it again, and there is some studies going on I know NuScale was

looking at for a while, as well.

So it would be interesting to see if there's any more that we might be able to gain from that, again, especially with --

(Audio interference.)

MS. RAY: In our international activities, we are gathering information on islanding and, therefore, we're gathering some information on load following. I believe my colleague, Matt, had his hand up.

MR. McCONNELL: Yes. This is Matthew McConnell, senior electrical engineer. Just to follow-up with that, yes, we're aware of the potential need and desire to become and operate more in a load-following manner. Actually, a few years ago, I was aware that there were several plants in the Midwest that were actually operating in that manner, and I do understand the potential impacts on not only just equipment in general but also in the qualification equipment when you talk about increased cycling and also how we structure our technical specifications. So our ear is firmly to the ground to hear what path and what route the industry is going to follow with that, and we will definitely pursue that as necessary.

MEMBER HALNON: Thank you, Matt.

MS. RAY: So as you can see, we're very busy. So of note, electrical staff work on all electrical and environmental qualification aspects of licensing projects for operating reactors, new reactors, as well as other nuclear facilities. We continue to align with the ADVANCE Act and the Commission PRA policies.

Our reg guide strategy is timely such that we make efforts to endorse the latest standard and include risk-informed performance-based methods. Our cooperation with FERC and NERC is instrumental in understanding grid status and any impacts to nuclear. And, lastly, we continue to engage our international counterparts to inform NRC's mission objectives.

We really appreciate your time and attention. Any questions?

MR. BROWN: I guess I can't stop. And this is tackling Reg Guide 1.9 again. One of those things we didn't talk about in our letter, if you look at the potential alternate sources, you mention two of them: wind and/or solar. And, obviously, you could put a giant battery at the plant which you keep charged all the time and it would last for some amount of time before you bought something else in, although that would be a risk-informed design decision if you

couldn't recharge it from the plant itself concurrent to the 110. But these other alternatives, other than diesels or combustion turbine generators, some of them involve weather conditions external to the plant. Whatever we do with the reg guide has to somehow communicate that external plant conditions, such as weather or weather impact, and how they could either impact negatively, permanently negatively depending on how long they lasted, so I think weather enters in, whereas with the diesels and combustion turbine generators, you just got to keep the gas tank full.

MS. RAY: Actually, I agree with you. We do include those aspects in both gas turbine and diesel standard. Let me finish.

MR. BROWN: Go ahead. I'm sorry. I was biting my tongue.

MS. RAY: Oh, sorry. On tornado depressurization.

MR. BROWN: Right.

MS. RAY: So that aspect on what's going on outside has to be considered, and my personal opinion is, yes, that has to be included in the generic section, as well.

MR. BROWN: Okay. But as well as in the C1 --

MS. RAY: Yes, absolutely, yes, yes.

MR. BROWN: -- if that's what you call a generic. There's a large discussion, which is very good, in the beginning of the whole thing which just talks about the application, et cetera. That's a very complete, comprehensive discussion. It was when we got to the other pieces that I had the difficulty.

But I did not mention weather type situations in our letter. We were complex enough as it was, and I think the committee probably helped me lighten it up a little bit so it wasn't quite as complex.

MS. RAY: We appreciated the comment. We also appreciate the comment that the beginning section was comprehensive. That's very appreciated to know that it's helpful.

MR. BROWN: Yes. This wasn't all negative.

CHAIR ROBERTS: Okay. Any other comments or questions for the staff? I just want to offer that I really appreciated this integrated presentation because what we see from you all is a lot of reg guides, and it's kind of hard sometimes to see how they all fit together, and I wanted to bring up a couple of big points I got out of this session. One

is you are looking at environmental qualification globally and what that means in terms of more applicants; and if NuScale were to come up with a different approach, you've got your eye on that. Looking at how to account or cover the beyond design basis experience or concerns, so you are looking at that. New technologies you're looking towards. You're looking at how to more risk inform, you know, what you've got in terms of your guidance out there. So you have those reg guides and your successful interface with both domestic and international agencies.

So it was very good to get an integrated picture in what you all are doing. I just wanted to thank you for putting it together, and I'm sure we'll have more discussions on those reg guides as they come through, but we got a good global understanding of what you're working on.

So with that, there's no comments from the public. Oh, sure. It's time for public comments. If there's anybody, a member of the public, would like to make a comment, please go ahead and raise your hand in Teams. I don't if there's any public in the room but if you'd like to make a comment, go ahead and raise your hand, and then, you know, unmute yourself and

state your comment. So I'll wait about ten seconds.

(Pause.)

CHAIR ROBERTS: Okay. Since there are no apparent issues in making a public comment, I'll go ahead and close the meeting if there are no other last-minute observations.

Okay. With that, the meeting is adjourned.

(Whereupon, the above-entitled matter went off the record at 2:36 p.m.)

ACRS: Electrical Engineering Briefing

March 20, 2025

Wendell Morton
Liliana Ramadan
Sheila Ray

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Opening Remarks

Wendell Morton

Acronyms

- BL - Bulletin
- BTP – Branch Technical Position
- CFR – Code of Federal Regulations
- DG – Draft Guide
- EDG – Emergency Diesel Generator
- EE – Electrical Engineering
- EQ – Environmental Qualification
- FERC – Federal Energy Regulatory Commission
- GDC – General Design Criteria
- IAEA – International Atomic Energy Agency
- IEC - International Electrotechnical Commission
- IEEE – Institute of Electrical and Electronics Engineers
- NEA – Nuclear Energy Agency
- NERC – North American Electric Reliability Corporation
- PRA – Probabilistic Risk Assessment
- RG – Regulatory Guide
- SRP – Standard Review Plan
- Std - Standard
- TSTF – Technical Specification Task Force

Agenda

- Opening Remarks
- Overview of Electrical Engineering (EE) & Environmental Qualification (EQ) regulations
- Licensing
  - EE & EQ activities in operating reactors, new and advanced reactors, small modular reactors, license renewal, & research projects
    - Open Phase
    - Regional Coordination
- Infrastructure
  - Vision & Strategy for EE Regulatory Guides (RGs) & Upcoming RG work
    - DG-1427 public comment resolution/status
    - RG 1.9 Status

Agenda, cont.

- Infrastructure, cont.
  - Continued Alignment with Commission Probabilistic Risk Assessment (PRA) Policy
    - Risk-informed graded approach – NuScale review
    - Technical Specification Task Force (TSTF) 505 license amendment requests
    - Open Phase Condition (risk-informed option)
    - Potential endorsement of IEEE Std. 1819
    - DG-1438 questions
  - Standard Review Plan Status
  - Operating Experience
- Federal Energy Regulatory Commission (FERC) and North American Electric Reliability Corporation (NERC) Coordination
- International Activities

Staff & Contributors

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  - Jorge Cintron, Brian Correll, Matthew McConnell, Kenneth Miller
- Instrumentation, Controls, and Electrical Engineering Branch (RES/DE/ICEEB)
  - Calvin Cheung, acting Branch Chief
  - Darrell Murdock, Mohammad Sadollah

Overview of Pertinent Regulations

- Electrical Engineering
  - 10 CFR 50, Appendix A, General Design Criteria (GDC)
    - GDC 17, “Electric Power Systems”
    - GDC 18, “Inspection and Testing of Electric Power Systems”
- Environmental Qualification
  - 10 CFR 50, Appendix A, GDC 4, “Environmental and Dynamic Effects Design Bases”
  - 10 CFR 50.49, “Environmental qualification of electric equipment important to safety for nuclear power plants”
- License Renewal
  - 10 CFR Part 54, “Requirements for Renewal of Operating Licenses for Nuclear Power Plants”

Licensing: Operating Reactors

- Operating Reactors
  - License Amendments, Notice of Enforcement Discretion, Allegations, etc.
  - Power Uprates
  - Regional Coordination
    - EE Counterpart Meeting with NRR, RES, Regions for technical discussions and dialogue
    - Inspection support

Licensing: Open Phase Condition

- What is an open phase condition (OPC)?
  - OPC is defined as the open circuit of one or two of the three phases of any offsite power circuit required for normal operation of electrical systems.
- What are the consequences?
  - The 2012 operating event at Byron Station (ML12272A358) revealed a significant design vulnerability issue
    - OPC in the plant's offsite power supply will cause a common cause failure of AC electric power system
    - Loss of safety functions of Engineered Safety Features
      - Both offsite and onsite electric power systems were not able to perform their intended safety functions due to the design vulnerability

Licensing: Open Phase Condition

- Past operating experience involved offsite power supply circuits that were rendered inoperable by an open-circuited phase, and the condition went undetected for several weeks because offsite power was not aligned during normal operation and the surveillance procedures, which recorded phase-to-phase voltage, did not identify the loss of the single phase.
- How was OPC addressed?
  - Detection, automatic trip response, and alarm in main control room
  - Risk-informed option - perform a risk evaluation under certain boundary conditions to support an alarm and manual response to an OPC

Licensing: Open Phase Condition

- NRC Actions Following the Byron event
  - July 2012 – Issued Bulletin 2012-01: Design Vulnerability in Electric Power System
  - February 2013 - Summary Report - Documented the review of licensee responses and staff recommendations
  - July 2015 – BTP 8-9 (Rev. 0) issued after resolution of public comments and review by ACRS
  - March 2017 – SRM-SECY-16-0068 directed staff to verify licensees' implementation and update the Reactor Oversight Process to provide periodic oversight of industry's implementation of OPC initiative
  - November 2016 – Issued Temporary Instruction (TI) 2515/192, "Inspection of the Licensee's Interim Compensatory Measures Associated with the Open Phase Condition (OPC) Design Vulnerabilities In Electric Power Systems."

Licensing: Open Phase Condition

- NRC Actions Following the Byron event, cont.
  - August 2020 - Issued Revision 2 of the TI 2515/194, "Inspection of the Licensees' Implementation of Industry Initiatives Associated with the Open Phase Condition Design Vulnerabilities in Electric Power Systems" to verify that licensees have appropriately implemented the voluntary industry initiative
  - March 2023 – Completion of issuance of closure letters to licensees and Bulletin 2012-01 closure
  - Current activities – Revision of BTP 8-9 (will be upcoming Revision 1)

Licensing: Advanced and Small Modular Reactors

- Advanced Reactors
  - Terrapower Construction Permit Application
- Small Modular Reactors
  - NuScale US460 Standard Design Approval

Licensing: Decommissioning & Nuclear Facilities

- Decommissioning
  - Peach Bottom Unit 1
    - Request for Alternative Schedule to complete decommissioning activities
- Nonpower Production and Utilization Facilities

Licensing: License Renewal

Initial License Renewal

- Clinton
- Comanche Peak
- Diablo Canyon
- Perry

Subsequent License Renewal

- Browns Ferry
- Dresden
- Monticello
- North Anna
- Oconee
- Peach Bottom
- Point Beach
- Surry
- St. Lucie
- Turkey Point
- VC Summer

Licensing: Research

- Research Projects
  - Valve-Regulated Lead-Acid battery technology
  - Islanding
  - Assessment of research efforts after the issuance of Expanded Materials Degradation Assessment (EMDA): Aging of Cables andCable Systems (NUREG/CR-7153, Volume 5)
  - Future Focused Research on novel and innovative cable condition monitoring techniques

Licensing: Environmental Qualification (EQ)

- Licensing of new reactors, advanced reactors and small modular reactors
- License Renewal
- Increased Enrichment of Conventional and Accident Tolerant Fuel
    - Extended power uprates and refueling frequency (PWRs).
    - Potential impacts to EQ design inputs such as radiological dose, pressure, temperature, etc.

Infrastructure: IEEE participation

- NRC staff provide technical expertise and offer technical insights to present agency positions for potential inclusion in standards and development of high-quality standards
- Under the IEEE Power and Energy Society, NRC staff participate in:
  - Nuclear Power Engineering Committee
  - Energy Storage and Stationary Battery Committee
  - Power System Relaying and Control Committee
  - Power System Communications and Cybersecurity Committee
  - Insulated Conductors Committee
  - Transformers Committee

Infrastructure: Vision & Strategy of EE Regulatory Guidance

- Inline with ADVANCE Act, Leverage Action Plan for Enhancing NRC's Codes and Standards Program for Future Reactors
- Focus on the agency mission and regulatory requirements when determining if an RG is needed or requires updating
- Represent a technically acceptable approach for allowing licensees, manufacturers, vendors, and NRC staff to effectively navigate and use regulatory guidance
- Prevent the ad hoc approach of generating additional regulatory guidance documents
- Gather and analyze operating experience
- Applicable to licensees and applicants subject to 10 CFR Parts 50 & 52

Infrastructure: Vision & Strategy of EE Regulatory Guidance

- Ensuring new RGs or revisions of RGs are aligned Commission PRA Policy and providing risk informed and performance-based methods
- Combine related standards on a technical topic into one RG
  - Reduced staff hours as compared to updating and maintaining several RGs
  - Reduced costs as compared to updating and maintaining several RGs
  - Technical Efficacy - Generates efficiencies such that industry/users have a one-stop shop on NRC positions on a particular topic
  - Process Efficiency – review process is streamlined for one RG on a technical topic (i.e., one public comment period on a technical topic)
  - Updates to a combined RG endorsing several standards would only be considered when there are significant changes that impact the staff's position or provide additional clarifications

Infrastructure: EE RG Checklist

- The EE RG Checklist was developed to improve and increase process efficiency
- Regulatory Guide and Programs Management Branch (RES/DE/RGPMB) owns the RG process
- EE staff are the technical leads for EE RGs
- EE RG Checklist provides an overview of the process and outlines actions to prepare a DG and publish the final RG
  - Incorporates insights from staff and management, share the lessons learned to help improve the development process

Infrastructure: DG-1427

- DG-1427, “Qualification of Fiber-Optic Cables, Connections, and Optical Fiber Splices for Use in Safety Systems for Production and Utilization Facilities.” ML24201A068
- Issued Oct 2024 to endorse, with clarifications, IEEE Std. 1682-2023, “IEEE Standard for Qualifying Fiber Optic Cables, Connections, and Optical Fiber Splices for Use in Safety Systems in Nuclear Power Generating Stations.”
- Public comments received and staff is addressing them to issue the final RG in Spring 2025.

Infrastructure: DG-1427

- ACRS comments in ACRS Planning & Procedures Portion of the October 2024 Full Committee Meeting
  - Related to the qualification for severe accident
    - Added paragraph in Background on 10 CFR 50.155(c)
    - Equipment relied on for the mitigation strategies and guidelines required by 10 CFR 50.155(b)(1) must have sufficient capacity and capability to perform the necessary functions.
    - Type testing could be used to demonstrate the capability of equipment to perform credited functions under extreme natural events or severe accident/design extension conditions.
  - Identification of regulatory positions as “exceptions” was deleted.

Infrastructure: Upcoming RG Work

- Risk-Informed Categorization of Electrical and Electronic Equipment
  - Staff is considering endorsement of the next revision of IEEE Std. 1819, “IEEE Standard for Risk-Informed Categorization and Treatment of Electrical and Electronic Equipment at Nuclear Power Generating Stations and Other Nuclear Facilities” in a new RG.
  - The next revision of the standard is expected in 2026
  - NRR/DRA is in the process of revising RG 1.201, “Guidelines for Categorizing Structures, Systems, and Components in Nuclear Power Plants According to Their Safety Significance”

Infrastructure: Upcoming RG Work

- Valve-Regulated Lead-Acid Batteries
  - New RG to endorse the following standards, with clarifications:
    - IEEE Std. 1187, “IEEE Recommended Practice for Installation Design and Installation of Valve-Regulated Lead-Acid Batteries for Stationary Applications”
    - IEEE Std. 1188, “IEEE Recommended Practice for Maintenance, Testing, and Replacement of Valve-Regulated Lead-Acid Batteries for Stationary Applications”
  - Expect to complete draft by end of 2025

Infrastructure: Upcoming RG Work

- Qualification of Vented Lead-Acid Batteries
  - Revision of RG 1.158 “Qualification of Safety-Related Lead Storage Batteries for Nuclear Power Plants”
  - To endorse, with clarifications, IEEE Std. 535-2022, “IEEE Standard for Qualification of Class 1E Vented Lead Acid Storage Batteries for Nuclear Power Generating Stations”
  - Expect to complete draft by Summer 2025

Infrastructure: Upcoming RG Work

- Standby Power Supply
  - Revision of RG 1.9 to include both emergency diesel generators and combustion gas turbines
  - To endorse, with clarifications:
    - IEC/IEEE 63332-387:2024, “Nuclear facilities -- Electrical power systems -- Diesel generator units applied as standby power sources”
    - IEEE Std. 2420-2019, “IEEE Standard Criteria for Combustion Turbine-Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations”
  - Expect to complete draft by Fall 2025

Infrastructure: Commission PRA Policy Alignment

- NuScale
  - Risk-informed graded approach to evaluate the DC systems
- Potential Endorsement of IEEE 1819
- Open Phase, as previously discussed
  - Risk-Informed Option
  - Revision of BTP 8-9

Infrastructure: Commission PRA Policy Alignment

- License Amendment Requests
  - TSTF-505, “Provide Risk-Informed Extended Completion Times – Risk Informed TSTF Initiative 4b” ML18183A493
  - TSTF-585, “Provide an Alternative to the LCO 3.0.3 One-Hour Preparation Time” ML23065A085
  - TSTF-439, “Eliminate Second Completion Times Limiting Time From Discovery of Failure to Meet an LCO” ML051860296
  - 10 CFR 50.69, “Risk-informed categorization and treatment of structures, systems and components for nuclear power reactors”
  - Technical Specification completion time extension

Infrastructure: Continued Alignment with the Commission PRA Policy

- DG-1438, “Periodic Testing of Electric Power and Protection Systems” (Proposed Revision 4 to RG 1.118)
- ACRS comments noting the paragraph on 10 CFR 50.155
- Expect publication of DG-1438 in Spring 2025

Infrastructure: Standard Review Plan Status

- Branch Technical Position (BTP) 8-8, “Onsite (Emergency Diesel Generators) and Offsite Power Sources Allowed Outage Time Extensions”
- BTP 8-9, “Open Phase Conditions in Electric Power System”

Infrastructure: Operating Experience

- Review electrical operating experience
  - Participate in Technical Review Groups to identify trends
  - Informs EE RG strategy
  - Potential for generic communications
  - Assist in standards development process

FERC/NERC Coordination

- FERC quarterly meetings
  - Restart of information exchange on technical topics of mutual interest
  - Met in January 2025 to discuss Blackstart, Texas Winter Storms, Quantified Risk of Loss of Offsite Power and Station Blackout
- NERC cooperation
- Biannual Joint Commission Meetings between FERC and NRC, with NERC participation

International Activities

- International Electrotechnical Commission (IEC)
  - Participate in development of international standards on EDG, battery, grid coordination, condition monitoring of cables, etc.
  - As NPP designers participate in the world market, international standards have been used for design, operation and maintenance in US licensing
  - Provide technical expertise, share operating experience, and offer technical insights to present agency positions for potential inclusion in standards

International Activities

- Nuclear Energy Agency (NEA)
  - Participate in Working Group on Electrical Power Systems.
  - Exchange of information and experience on the safety of electrical systems.
  - Facilitate international convergence on safety issues related to the safety of electrical systems and, where practicable, seek to develop a shared understanding and recommend solutions on important issues.
  - Allow prompt attention to evolving electrical plant events to share the lessons learned.

International Activities

- International Atomic Energy Agency (IAEA)
  - Participate and author sections for the revision to Nuclear Energy Series NG-T-3.8, “Electric Grid Reliability and Interface with Nuclear Power Plants” to include information on the development, deployment, and oversight of small modular reactors
  - Participate in the update of Safety Report Series No. 82, Revision 2, “Ageing Management for Nuclear Power Plants: International Generic Ageing Lessons Learned (IGALL)”

International Activities

- Poland
  - The NRC and Poland's nuclear regulator, the National Atomic Energy Agency (known as PAA), have a cooperation agreement.
  - The cooperation included an exchange information on Westinghouse's AP1000 electrical systems, offsite power, inspections, & EQ in Summer 2024.

International Activities

- Romania
  - Bilateral cooperation for technical exchange & regulatory information sharing
  - Shared information on EQ and DC systems in Summer 2024
- Other countries
  - Routinely respond to information requests on EDG, grid, and other technical topics

Summary

- Advance licensing projects on operating reactors, advanced reactors, small modular reactors and production and utilization facilities.
- Continued alignment with ADVANCE Act & Commission PRA Policy.
- Initiate new and revised RGs based on up-to-date standards, operating experience, and risk informed and performance-based methods.
- Coordinate with FERC/NERC on the state of the grid and impact on nuclear.
- Engage international counterparts to inform NRC's mission objectives.

Thank you for your time and attention.

Questions?